

Name: _____

World in a Bottle

Here is an essay about an experiment written by the Dutch scientist Jan Van Helmont in 1648:

I took an Earthen Vessel, in which I put 200 pounds of Earth that had been dried in a Furnace, which I moistened with Rain-water, and I implanted therein the Trunk or Stem of a Willow Tree, weighing five pounds;

and at length, five years being finished, the Tree sprung from thence, did weigh 169 pounds, and about three ounces:

But I moistened the Earthen Vessel with Rain-water or distilled water (always when there was need) and it was large, and implanted into the Earth, and least the dust that flew about should be co-mingled with the Earth, I covered the lip or mouth of the Vessel, with an Iron-Plate covered with Tin, and easily passable with many holes.

I computed not the weight of the leaves that fell off in the four Autumnes. At length, I again dried the Earth of the Vessel, and there were found the same 200 pounds, wanting about two ounces. Therefore 164 pounds of Wood, Barks, and Roots, arose out of water onely.

Ortus medicinae, Id est, initia physicae inavidita. Progressus medicinae novus, in morborum, ultionem, ad vitam longam ... (Amsterdam: Elzevir, 1648, found in *Oriatricke*)

1. From what source did people of Van Helmont's time think plants got their mass? _____

2. Why did Van Helmont weigh the soil first? _____

3. How long did Van Helmont watch the plant? _____

4. How much mass did the plant gain? _____

5. How much mass did the soil lose? _____

6. Where did the mass that was lost from the soil go? _____

7. How did Van Helmont make sure his experiment had only one variable? _____

8. From what source did Van Helmont believe the mass of the large willow came? _____

9. What was Van Helmont's hypothesis? _____

10. Did Van Helmont prove his hypothesis? _____

11. What other explanations might skeptics have given for Van Helmont's results? _____

A Look at a Pond Community

It is very difficult to measure all of the living things in a community, but it has been done. One ecologist emptied all of the water out of a small pond and found the mass of every living thing in the pond. Here are the data for 10 m² of a pond community similar to the one he studied:

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|---|------------|
| Plants and green algae | 6000 grams |
| Plant eating protists and invertebrates | 370 grams |
| Fish and mollusks that eat protists and invertebrates | 110 grams |
| Animals that eat small fish and mollusks | 15 grams |
| Decomposers (fungus and bacteria) | 50grams |

Obtain a large piece of paper (11 x 14 inches) from your teacher. Using a ruler, make an X-axis line at least 10 inches long across the short end of the paper. Divide this line into five spaces, 2 inches each. Again using the ruler, draw a vertical line for the Y-axis. Label this axis “grams”. Place a mark every 1.5 inches up the line. Each mark will represent 500 grams. Carefully divide the bottom 500 grams into 5 equal spaces to help find 100s.

Make a bar graph of the data. Make the bars 1 inch wide. Color them in a solid color. Then carefully cut out the bars and place them on another piece of large paper. Put the largest bar horizontally at the bottom of the paper and label it “Producers.” Put the next largest bar on top of it (to make a pyramid) and label it “First Order Consumers.” Keep going with second and third order consumers, but hold onto the decomposer bar. Glue the bars to the paper in a pyramid shape. Answer these questions:

1. Why must there be fewer consumers than producers? _____

2. What kinds of invertebrates eat plants in a pond? _____

3. How can there be more decomposers than third consumers? _____
